PENNSYLVANIA RAILROAD, MANAYUNK BRIDGE HAER No. PA-551
Pennsylvania Historic Railroad Bridges Recording Project
Spanning Schuylkill Expressway (I-76), Schuylkill River, and Green Ln.
Philadelphia
Philadelphia County
Pennsylvania

PHOTOGRAPHS

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HISTORIC AMERICAN ENGINEERING RECORD
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HAER No. PA-551

Location:	Spanning Schuylkill Expressway (I-76), Schuylkill River, and Green Ln., between Philadelphia, Philadelphia County, and West Manayunk, Montgomery County, Pennsylvania.
USGS Quadrangle:	Germantown, Pennsylvania (7.5-minute series).
UTM Coordinates:	18/480625/4430355
Date of Construction:	1918.
Basis for Dating:	Secondary sources.
Dates of Alteration:	1996-2000 (ongoing).
Designer:	Pennsylvania Railroad: Alexander C. Shand, Chief Engineer; H. R. Leonard, Engineer of Bridges and Buildings.
Builder:	T. L. Eyre (Philadelphia).
Present Owner:	Southeastern Pennsylvania Transportation Authority (SEPTA).
Present Use:	Railroad bridge (out of service).
Structure Types:	Concrete arch, riveted deck and half-through girders.
Significance:	The Manayunk Bridge's nine open-spandrel reinforced concrete arches follow an unusual reverse curvature, which earns it the nickname "S-Bridge." Towering over the town of Manayunk and the Schuylkill Expressway, the bridge is a prominent local landmark.
Historian:	Justin M. Spivey, April 2000.
Project Information:	The Historic American Engineering Record (HAER) conducted the Pennsylvania Historic Railroad Bridges Recording Project during 1999 and 2000, under the direction of Eric N. DeLony, Chief. The project was supported by the Consolidated Rail Corporation (Conrail) and a grant from the Pennsylvania Historical and

Museum Commission (PHMC). Justin M. Spivey, HAER engineer, researched and wrote the final reports. Preston M. Thayer, historian, Fredericksburg, Virginia, conducted preliminary research under contract. Jet Lowe, HAER photographer, and Joseph E. B. Elliott, contract photographer, Sellersville, Pennsylvania, produced large-format photographs.

Description and History

The former Pennsylvania Railroad (PRR) Schuylkill Valley Division diverges from the main line west of Philadelphia, sweeps around Westminster Cemetery, then snakes across the river on a curving concrete arch bridge into Manayunk. A previous double-track, wrought-iron truss bridge on this site was completed in 1884 for the Pennsylvania Schuylkill Valley Railroad (PSV), whose main line ran from Philadelphia to Reading.[1] The PRR leased the PSV from its inception and fully absorbed the company in 1902 as its Schuylkill Valley Division.[2] This line, essentially parallel to the Philadelphia & Reading Railroad (P&R), helped the PRR to compete in the coal and iron markets of the Schuylkill River valley. The PRR replaced the Manayunk Bridge in 1918 in order to run heavier trains.

The concrete bridge and its wrought-iron predecessor were both nicknamed "S-Bridge," referring to their reverse curvature that resembles the letter "S" in plan.[3] This provides a smooth transition between the approaching tracks, which run parallel to the river banks on opposite sides, and the bridge itself, which crosses the river on a skew. An article in *Engineering News-Record* noted that "the alignment of the new bridge is radically different from that of the old," with the concrete bridge constructed upstream of its predecessor, on a design with gentler curves further refined by spiral transitions.[4] The present bridge's fifteen double-track spans include five riveted steel deck girders (some over the P&R main line) on the south approach, nine open-spandrel reinforced concrete arches, and two half-through girders on the north approach. The arch spans, from south to north, are two at 90'-0" over the Schuylkill Expressway (I-76), one at 120'-0", three at 150'-0" over the river, one at 120'-0" over the Schuylkill Canal, and two at 105'-0" over Green Lane and Main Street in Manayunk.

PRR Chief Engineer Alexander C. Shand likely chose reinforced concrete for the main spans because it was then surging in popularity as an strong, durable material that allowed architectural expression without great cost. Indeed, the bridge's ornamental features, such as its classically proportioned piers or the moldings and corbels under the parapet, are among its principal charms. Some of the architectural details serve practical purposes as well. The balconies above the piers are safety niches for track workers. Incised lines — resembling oversized voussoirs in the arches or horizontal coursing in the piers — disguise breaks between concrete pours. Executing complex geometry in the new material, however, presented challenges to the railroad's bridge engineers, and to the contractor, T. L. Eyre of Philadelphia. The arches' construction joints, for instance, occur on saw-toothed lines resulting from the 65-degree skew. Some of the spans are actually curved in plan, which would have required complex formwork.[5]

The bridge has since proven that concrete, while durable, is by no means a permanent material. The Southeastern Pennsylvania Transportation Authority (SEPTA) acquired the Manayunk Bridge in 1976, after the demise of the PRR's successor, Penn Central. SEPTA operated commuter trains across the bridge to serve Manayunk and Ivy Ridge, but only until 1986, when concerns arose about its structural integrity. Falling pieces of concrete prompted the installation of safety nets over the expressway and city streets in 1992.[6] Although the bridge's designers had correctly predicted that forces from expansion and contraction would dominate the loads on the structure, a 1994 structural analysis revealed that such forces are causing the concrete to spall from the bridge. Corrosion of the steel reinforcement by chemicals in the concrete, a common problem in older reinforced concrete structures, was also a factor. In 1996, SEPTA began removing the surface layer of material from the bridge and replacing it with new concrete cast in place, seeking to extend the bridge's life another thirty years and restore train service across it.[7]

Notes

1. The Keystone Bridge Company of Pittsburgh constructed a wrought-iron superstructure on stone piers and abutments constructed by E. D. Smith of Philadelphia; see contracts No. 444 and No. 506 in file: Manayunk, Pa. 1883-1884, Box 750, Construction Contracts, Engineering Department, Pennsylvania Railroad Company records, Acc. 1807, Hagley Museum and Library, Greenville, Del.

2. Thomas T. Taber III, *Railroads of Pennsylvania: Encyclopedia and Atlas* (Muncy, Pa.: Thomas T. Taber III, 1987), 418; also Howard W. Schotter, *The Growth and Development of the Pennsylvania Railroad Company: A Review of the Charter and Annual Reports of the Pennsylvania Railroad Company 1846 to 1926* (Philadelphia: Press of Allen, Lane, and Scott, 1927), 205, 264.

3. For an example of the 1884 bridge's nickname, see caption of postcard in Pennsylvania Railroad scrapbook, page 353, Larry Woolsten collection, Railroad Museum of Pennsylvania, Pennsylvania Historical and Museum Commission, Strasburg, Pa.

4. "Pa. Arch Bridge Crosses Schuylkill River," *Engineering News-Record* 78, No. 8 (24 May 1917), 388-90, cited in Nick Myers, Roxborough-Manayunk-Wissahickon Historical Society, to author, 28 Feb. 2000.

5. Albert M. Wolf, "New Pennsylvania Railroad Bridge at Manayunk, Pa.," *Railway Review* 62, No. 6 (9 Feb. 1918): 194-9.

6. John Segletes, "The Pennsylvania Railroad Bridge at Manayunk," typescript, 1996, located at Roxborough-Manayunk-Wissahickon Historical Society, cited in Myers, to author, 28 Feb. 2000.

7. Rafail Veksler and Abhay P. Thorat, "The Arch Bridge Mystery," *Civil Engineering* 69, No. 9 (Sep. 1999): 48-51.

Acknowledgment

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Additional Source

1. Milepost 0.59, region/division/branch 100361, aperture card files, Consolidated Rail Corporation, Philadelphia, Pa. [transferred to Norfolk Southern Railway Co., Atlanta, Ga.].